

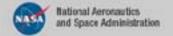
# Rocky Mountain Death Trap: The Mann Gulch Fire

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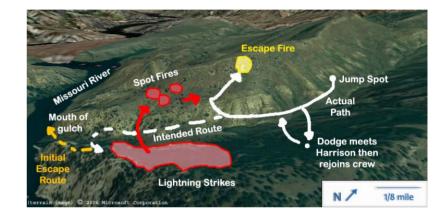
https://sma.nasa.gov/safety-messages



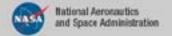


### The Firestorm

- On August 4<sup>th</sup>, 1949 a lightning induced "smoker" started along the south ridge of Mann Gulch, located 20 miles north of Helena, Montana. The fire was spotted the next day and a team of 15 smokejumpers was dispatched.
- The plan was to proceed down the north slope and attack the fire from its rear flank, using the Missouri river as an escape route.
- Unknown to the crew, the fire had jumped across the gulch to the north ridge eliminating the path to safety. Given the very dry conditions, the fire spread rapidly – up to 700 feet per minute.
- Seeing smoke ahead, Foreman Wagner Dodge ordered the team to reverse direction, but the fire quickly caught up to them.



- Dodge lit a intentional burn zone or 'escape fire' and urged his men to take refuge. The team ignored Dodge as discipline shattered and it became every man for himself.
- Dodge survived as did two others who made it over the ridge to safety. The rest were overtaken by the fire and died.



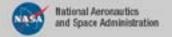


## **US Forest Service Smokejumpers**

- Management Approach: The Forest Service embraced a low overhead-low cost organizational approach wherein a pool of 150 smokejumpers were used in a rotational fashion.
  - Team members were frequently strangers and seldom had experience with their leaders.
  - Trust in the foreman's plan may have saved the lives of all 15 men.
- Smokejumper Equipment:
   Firefighters wore blue jeans, long sleeved cotton shirts, and baseball caps.
  - Better personal protective equipment could have saved lives.



As a result of the Mann Gulch deaths, the Forest Service developed more robust smokejumper equipment.





#### **Proximate Causes in Event Chain**

- Unexpected winds carried the compact fire confined to the south ridgeline over the mouth of the gulch and lower north ridge, closing off both the planned attack and escape routes.
- Steep terrain, strong up-gulch winds, and dry, fast burning fuel allowed the fire to move rapidly up the north ridge overtaking the firefighters.

### Causal Web – Underlying Issues

- Inadequate overall smokejumper management approach
  - Lack of discipline/Inadequate training: The Forest Service had no formal team development training and individuals had little to no experience working with superiors or team members.
  - Ignored leadership: The crew had no experience with intentional burn zones and did not trust or understand the foreman's rescue plan.
  - Failed communication: If Dodge had been able to communicate over the noise of the roaring firestorm he may have been able to persuade the men to take cover in the escape fire zone.
- Incomplete understanding of prevailing weather conditions, terrain and likely fire behavior
  - Managers on the scene did indeed define an escape route: once they reached the river and flanked the fire they would have a clear and easy (downhill) retreat path to the Missouri River.
  - The journey from the drop zone to the river had no viable contingency plan.
  - In planning both their attack and retreat strategies, the team leaders did not give adequate consideration to the dynamic nature of fire and weather conditions.





### **NASA Applicability**

Safety and mission success is critically dependent on robust management processes which emphasize:

- The importance of teamwork, communication, training, and trust for crews involved in hazardous ground and space operations
- The need for continual emphasis on team training, operational process discipline, and safety critical decision making
- The need to understand operating environments and the potential for dynamic changes (off nominal behavior)
- The necessity of understanding the physics of possible failures and their consequences, in order to determine if risks have been properly mitigated
- The importance of developing and using proper personal protective equipment for teams working in hazardous environments

